

WHAT IS CLAIMED IS:

1. A network management unit for managing a network that includes a plurality of network elements coupled by communication links, the management unit comprising:
  - a warehouse module, the warehouse module operatively coupled to at least one network element, the warehouse module adapted to interact with the network element to facilitate data retrieval and network element operation control;
  - an agents module, the agents module modeling functional operation of at least one network element that is in communication with the management unit, the agents module operatively coupled to the warehouse module to facilitate communication with the associated network element, the agents module adapted to transmit commands to the warehouse module to facilitate service requests; and
  - a presentation module, the presentation module facilitating local implementation of task requests from external management applications, the presentation module communicating with the agents module to transmit service requests to the agents module in accordance with the task requests.
2. The management unit of Claim 1, further comprising an application module, the application module adapted to facilitate the transmission of task requests from external management applications to the management unit.
3. The management unit of Claim 2, wherein the application module comprises:
  - a session manager to initiate and control a session with the presentation module;
  - an authentication manager to facilitate security clearance with the presentation module; and
  - a plurality of available service routines corresponding to services available from the presentation module.
4. The management unit of Claim 2, further comprising a shell interface for facilitating communication between the application module and external management applications.
5. The management unit of Claim 1, wherein the agents module comprises:
  - an investigation component, the investigation component adapted to initiate and configure device components for the agents module;
  - a plurality of device components, each device component modeling at least one network element function;

a configuration component, the configuration component adapted to facilitate the command execution by device component operations in response to receiving commands from the presentation module; and

a network element translator, the network element translator facilitating the communication between device components and the warehouse module so as to facilitate data translation between the device components and the warehouse module.

6. The management unit of Claim 1, wherein the warehouse module comprises a registry and a plurality of collector modules.

7. The management unit of Claim 1, wherein the warehouse module comprises:

a database translator to facilitate the storage and retrieval of network data and management unit configuration data;

a directory service translator to facilitate the resolution of addresses for network elements and external systems;

a message queue to facilitate the transmission of messages between management unit modules residing in remote management units;

a registry to facilitate the registration of the agents module for network element data; and

a plurality of collectors to communicate with network elements.

8. The management unit of Claim 7, wherein the plurality of collectors comprises an SNMP collector.

9. The management unit of Claim 7, wherein the plurality of collectors comprises a Telnet collector.

10. A method for processing network event data in a network including network elements coupled together by communication links, the network elements including logical and physical functions, comprising:

modeling the internal state behavior of the logical and physical functions of network elements by associating a modeling component with each function of a network element;

identifying dependencies and peer links for said logical and physical functions of the network elements;

associating each modeling component with corresponding acquaintance links in accordance with the identified dependencies and peer links for the associated function of the modeling component; and

transmitting at least one message from a first modeling component to a second modeling component in accordance with the acquaintance links of the first modeling component in response to network event data to facilitate the distributed processing of the network event data.

11. The method of Claim 10, further comprising generating the message by referring to the network event data as applicable to a predetermined decision flow corresponding to the modeled function of the modeling component.

12. A method for implementing a network operation modification in a communication network including network elements coupled together by communication links, comprising:

associating each network element with at least one component that models the operation of functions in the network element, the component adapted to transmit operating commands to the network element;

receiving a command indicating a requested change in operation of the communication network;

verifying proper communication network operation by facilitating the command in the network modeling components; and

implementing the command by employing the network modeling components corresponding to each network element associated with the command if proper operation is verified.

13. A method for executing a network task in a communication network that includes a plurality of network elements operatively coupled by communication links and a management unit associated with each network element, comprising:

receiving task request data into a first management unit;

determining whether a portion of the task is applicable to the first management unit;

prompting the execution of a portion of the requested task in the first management unit when a portion of the task is applicable to the first management unit;

determining whether all portions of the task have been prompted for; and

transmitting a message to at least a second management unit when all portions of the task have not been prompted for, the message including the task request data.

14. A method for facilitating an information request in a management network that includes a plurality of management units, comprising:

- receiving an information request from an external application into a first management unit;

- processing the information request in an application server, the processing facilitating at least the identification of management unit services associated with the information request;

- initiating a local task in the first management unit to facilitate a first management unit service corresponding to the information request;

- transmitting a message from the local task to a remote application server in a second management unit, the message including at least the information request;

- initiating a local task in the second management unit to facilitate a second management unit service corresponding to the information request;

- responding to the message by transmitting a message from the application server in the second management unit to the application server in the first management unit, the response including result data for the local task;

- aggregating responses from remote management units in the first management unit application server; and

- transmitting a reply to the information request to the external application.

15. A method for modeling the functionality of a network element in a network, comprising:

- communicating with the network element to identify functionality in network element;

- spawning a modeling element corresponding to at least one identified functionality in the network element;

- communicating with the network element to identify attribute data for the identified functionality; and

- updating the modeling data employed by the modeling element in accordance with the attribute data for the identified functionality.

16. The method of Claim 15, further comprising periodically communicating with the network element to identify changes to attributes of the network element and update the modeling data in the modeling element.

17. A method for managing network event data, comprising:

modeling parts of a network by associating individual modeling components with network functions, the modeling is of at least the relationships between the network functions;

receiving network event data into a modeling component;

selecting an event response operation in the modeling component by referring to the network event data;

transmitting at least one message to a second modeling component, the message including data in accordance with the event response operation result, the transmitting is in accordance with relationships corresponding to network functions associated with the modeling component.

18. A method for facilitating the execution of a task, which requires end-to-end knowledge of a network, comprising:

modeling parts of the network by individual modeling components, the modeling is of at least the relationships between physical and logical functionalities and the operation of functionalities of network elements;

transmitting commands from the modeling components to an associated network element to control the operation of the functionality; and

transmitting a plurality of messages between said modeling components to facilitate a portion of the task in each component, whereby each component communicates with associated functionality if the functionality is part of the required task, the message directed in accordance with the relationships provided by the modeling components.

19. The method of Claim 18, wherein the task is an information query.

20. The method of Claim 18, wherein the task is a provisioning operation.

21. A method for identifying target management components for network task operations, comprising:

associating an autonomous agent with at least one network element in the network;

associating a plurality of device components with each autonomous agent, each device component modeling a data network entity;

storing dependency links between device components of an autonomous agent in accordance with dependencies associated with the modeled data network entity corresponding to the autonomous agent;

storing peer links between device components of a first autonomous agents and a second autonomous agent in accordance with logical and physical links between a data network entity corresponding to the first autonomous agent and a data network entity corresponding to the second autonomous agent; and

referring to the stored dependency links and peer links to identify target device components for network management task implementation.

22. A method for passing information between autonomous agents modeling logical and physical functions, comprising:

storing relationship identifiers for each modeling agent, the relationship identifiers corresponding to physical and logical connections between the functionalities; and

transmitting a message from an autonomous agent in response to an event by employing at least the stored relationship identifiers associated with the agent.

23. An extensible software architecture for facilitating the mapping and analysis of a communication network, comprising, on a computer readable medium:

a mapping component which has executable code for scanning a network and for generating a map of the network, the map represented by the mapping component as a data structure which comprises a collection of device components and links, the device components representing functions of network elements of the network and the links representing relationships between the device components; and

an application program interface which includes methods that enable external applications to access the device components of the map data structure to obtain information about the network, and which includes methods that enable the external applications to modify the operation of the network and to convey network information to a user via a user interface.

24. A method for modeling a network element for facilitating the mapping and analysis of a communication network, comprising:

associating functions of the network element with device components,  
whereby each device component models the operation of an associated function;  
storing link data for relationships between functions of the network  
element; and  
associating link data to a device components by referring to the function  
which is associated with the device components.

25. A method for retrieving function data corresponding to a function of a network  
element, comprising:

transmitting a request from a modeling component to an instrumentation  
manager, the request identifying a network element function;  
receiving the request by the instrumentation manager and forwarding the  
request to a collector element in accordance with the network element type;  
collecting data from the network element by the collector element receiving  
the request;  
transmitting network element data to the instrumentation manager;  
formatting the network element data for use by the requesting modeling  
component; and  
transmitting the formatted data to the modeling component to provide  
network element function data to the modeling component.